IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences

Applicants	:	Joshua Lawrence Koslov
Application No.:		10/589,764
Filed	:	August 17, 2006
For	:	METHOD AND APPARATUS FOR CARRIER RECOVERY IN A COMMUNICATION SYSTEM
Examiner	:	Sudhanshu C. Pathak
Art Unit	:	2611

APPEAL BRIEF

Mail Stop: Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

May It Please The Honorable Board:

Applicants appeal from the FINAL Office Action dated December 7, 2009, and the Advisory Action dated March 30, 2010, in which claims 1-27 of the above-identified application stand rejected.

Applicant waives an Oral Hearing for this appeal.

Please charge the $540.00 fee for filing this Brief to Deposit Account No. 07-0832.

Please charge any additional fee or credit overpayment to the above-indicated Deposit Account.

TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The real party in interest of Application No. 10/589,764 is:

Thomson Licensing
1, rue Jeanne d'Arc
92443 Issy-les-Moulineaux Cedex
France

II. RELATED APPEALS AND INTERFERENCES

There are no related Appeals or Interferences.

III. STATUS OF THE CLAIMS

Claims 1-27 are pending in this application.

Claims 1-27 have been rejected.

The rejection of claims 1-27 are appealed.

IV. STATUS OF AMENDMENTS

In response to the FINAL Office Action dated December 7, 2009, and the Advisory Action dated March 30, 2010, Applicant's representative filed a Notice of Appeal on May 28, 2010 along with a three month extension of time.

This appeal is directed to the claims as they stood at the time of the FINAL Office Action dated December 7, 2009, and the Advisory Action dated March 30, 2010, and which are shown in the Claims Appendix of this Brief.

It should be noted that the Official Action summary sheet in the FINAL Office Action dated December 7, 2009 refers to claims 1-35, as does paragraph number 1 on the top of page 2 of the Official Action. In Applicant's reply dated March 4, 2010, Applicant again requested the Examiner to enter the PCT Article 19 amendment that amended claims 1-35 to claims 1-27 prior to entry into the U.S. national phase. The PCT Article 19 claims are the claims that entered the national phase. In this regard, the Advisory Action dated March 30, 2010, appears to now correctly refer to claims 1-27.

V. SUMMARY OF CLAIMED SUBJECT MATTER

There are four independent claims pending in this application: 1, 10, 16 and 19.

As noted in the background of Applicant's specification, in a layered modulation based communication system, at the receiver, the received signal has an upper layer (UL) signal component and a lower layer (LL) signal component, i.e., the received signal is a combination of the upper and lower layers, and the receiver processes the received signal to recover the upper layer data (conveyed in the UL signal component) and the lower layer data (conveyed in the LL signal component). With respect to recovery of the upper layer data – since the power level of the UL signal is much higher than the LL signal – the receiver simply demodulates and processes the received signal as if it were only composed of the UL signal component plus channel noise – in effect treating the LL signal component of the received signal as noise. However, with respect to recovery of the lower layer data, since the power level of the LL signal is lower, the receiver processes the received signal to first extract the LL signal component from the received signal. The receiver then processes the extracted LL signal component to recover the lower layer data. (Applicant's specification, p. 1, lns. 6-26.)

In extracting the LL signal component, a recovered carrier is developed by a carrier recovery process driven by hard decisions. However, Applicant has observed that generating a derotated version of the received signal by using a hard-decision based recovered carrier may additionally degrade the lower layer signal component – thus, further impeding accurate recovery of the lower layer data. Therefore, and in accordance with the principles of the invention, a receiver receives a layered modulation signal having at least two signal layers, and recovers a carrier from the received signal as a function of soft decisions with respect to one of the at least two layers. (Applicant's specification, p. 2, lns. 8-14.)

In view of the above, Applicant's independent claim 1 is directed to a method for receiving a multi-level modulation signal having at least two signal layers (e.g., signal 311 of FIG. 7), recovering a carrier (e.g., signal 346 of FIG. 7) from the received multi-level modulation signal as a function of soft decisions with respect to a first layer of the at least two layers (e.g., element 345 of FIG. 7); and using the recovered carrier to recover a different layer of the at least two signal layers (e.g., element 360 of FIG. 7). (Applicant's specification, p. 8, ln. 16 to p. 9, ln. 27; p. 11, ln. 13 to p. 12, ln. 6.)

Applicants' independent claim 10 is similar to Applicants' independent claim 1, and is directed to a method for demodulating and soft decoding a first layer signal component of a received multi-level modulation signal to provide a decoded first layer signal (e.g., elements 330 and 335 of FIG. 7); remapping the decoded first layer signal to provided a remapped first layer signal (e.g., element 340 of FIG. 7); generating a soft-decision based carrier from the received multi-level modulation signal as a function of the remapped first layer signal (e.g., element 345 of FIG. 7); and demodulating a second layer signal component of the received multi-level modulation signal using the soft-decision based carrier (e.g., elements 360, 365, 370, 375 and 380 of FIG. 7). (Applicant's specification, p. 8, ln. 16 to p. 9, ln. 27; p. 11, ln. 13 to p. 12, ln. 6.)

Applicants' independent claim 16 is similar to Applicants' independent claim 1, and is directed to a method for receiving a multi-level modulation signal (e.g., signal 311 of FIG. 7), performing a carrier recovery process driven by soft decisions with respect to a first layer signal component of the received multi-level modulation signal (e.g., element 345 of FIG. 7) to provide a recovered carrier (e.g., signal 346 of FIG. 7); and demodulating and decoding a second layer signal component of the received multi-level modulation signal as a function of the recovered carrier (e.g., elements 360, 365, 370, 375 and 380 of FIG. 7). (Applicant's specification, p. 8, ln. 16 to p. 9, ln. 27; p. 11, ln. 13 to p. 12, ln. 6.)

Finally, Applicant's independent claim 19 is an apparatus claim directed to a first demodulator for demodulating a received signal to provide a demodulated first layer signal (e.g., element 330 of FIG. 7); a first decoder for decoding the demodulated first layer signal to provide a decoded first layer signal (e.g., element 335 of FIG. 7); a remapper for remapping the decoded first layer signal to provide a remapped first layer signal (e.g., element 340 of FIG. 7); and a carrier recovery element responsive to the remapped first layer signal and the received signal to provide a soft-decision based carrier (e.g., element 345 of FIG. 7); a derotator for derotating the received signal with the soft-decision based carrier to provide a derotated version of the received signal (e.g., element 360 of FIG. 7); and an extractor responsive to the derotated received signal and remapped first layer signal for providing a second layer signal component of the received signal (e.g., elements 365 and 370 of FIG. 7; dependent claim 20). (Applicant's specification, p. 8, ln. 16 to p. 9, ln. 27; p. 11, ln. 13 to p. 12, ln. 6.)

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

There is a single ground of rejection to be reviewed on Appeal.

(1) Whether claims 1-27 are unpatentable under 35 U.S.C. §103(a) over WO 02/089371 (*Chen*) in view of U.S. Patent No. 7,499,507 issued March 3, 2009 to Jaffe et al. (*Jaffe*).

VII. ARGUMENT

Rejection of Claims 1-27 under 35 U.S.C. §103(a) as being unpatentable over WO 02/089371 (*Chen*) in view of U.S. Patent No. 7,499,507 issued March 3, 2009 to Jaffe et al. (*Jaffe*).

CLAIMS 1-27

Independent claims 1, 10, 16 and 19 are patentable over WO 02/089371 (*Chen*) in view of U.S. Patent No. 7,499,507 issued March 3, 2009 to Jaffe et al. (*Jaffe*).

Applicants' dependent claims 2-9, 11-15, 17-18 and 20-27 stand or fall with their respective independent claims 1, 10, 16 and 19.

CLAIMS 1-27 ARE PATENTABLE

At the outset, Applicant's claimed invention is directed to recovering a carrier as a function of soft decisions. As known in the art, the phrase "soft decision" is different from the phrase "hard decision". In a "hard decision", each received symbol is evaluated independently to be, e.g., a one or a zero. However, in a "soft decision", an error correcting code is used in the receiver to further process the sequence of received symbols generated by hard decisions to determine the most likely received sequence of symbols. In this regard, Applicant's claimed invention uses the decoded symbols to assist in recovering the carrier.

In view of the above, the Examiner's interpretation of *Chen* is respectfully wrong. For example, the Examiner points to claim 6 of *Chen*, which states.

> *Chen*, claim 6. A receiver system for demodulating and decoding layered transmission signals, comprising:
> a first demodulator (404) for demodulating a first carrier of a first layer (100) of a received signal;
> a first layer decoder (402) for decoding the first layer (100) producing first symbols (102) for a first layer transport;
> a remodulator (406) for receiving the first signal symbols (102) and producing a first layer signal (100);
> a subtracter (412) for subtracting the first layer signal (100) from the received signal and producing a second layer signal (106);
> a second layer demodulator (410) receiving the second layer signal (106) for demodulating a second carrier of a second layer and producing a second demodulator output; and

> a second layer decoder (408) receiving the second demodulator output and decoding the second layer producing second signal symbols (104) for a secondlayer transport.
>
> *Chen*, p. 14, emphasis added.

Nowhere does claim 6 of *Chen* refer to recovering a carrier – let alone recovering a carrier as claimed by Applicant. In fact, the language in claim 6 is clear. The first demodulator demodulates a first carrier, and the second layer demodulator demodulates a second carrier. This is not recovering a carrier as a function of soft decisions as claimed by Applicant.

The Examiner also refers to p. 2, lns. 5-15 of *Chen*, which states:

> [s]ignals, systems and methods for transmitting and receiving non-coherent layered modulation for digital signals are presented. For example, a layered signal for transmitting data, comprises a first signal layer including a first carrier and first signal symbols for a first digital signal transmission and a second signal layer including a second carrier and second signal symbols for a second signal transmission disposed on the first signal layer, wherein the layered signal has the first carrier demodulated and first layer decoded to produce the first signal symbols for a first layer transport, the first signal symbols are remodulated and subtracted from the layered signal to produce the second signal layer, and the second signal layer has the second carrier demodulated and decoded to produce the second signal symbols for a second layer transport.
>
> *Chen*, p. 2, lns. 5-15, emphasis added.

Again, nowhere does this passage from *Chen* describe, or even suggest, recovering a carrier – let alone recovering a carrier as a function of soft decisions claimed by Applicant. The language in this portion of *Chen* is clear – the first carrier is demodulated and the second carrier is demodulated.

Finally, the Examiner refers to p. 7, ln. 23 to p. 10, ln. 18 and FIGs. 4A and 4B of *Chen*. FIG. 4A of *Chen* is reproduced below.

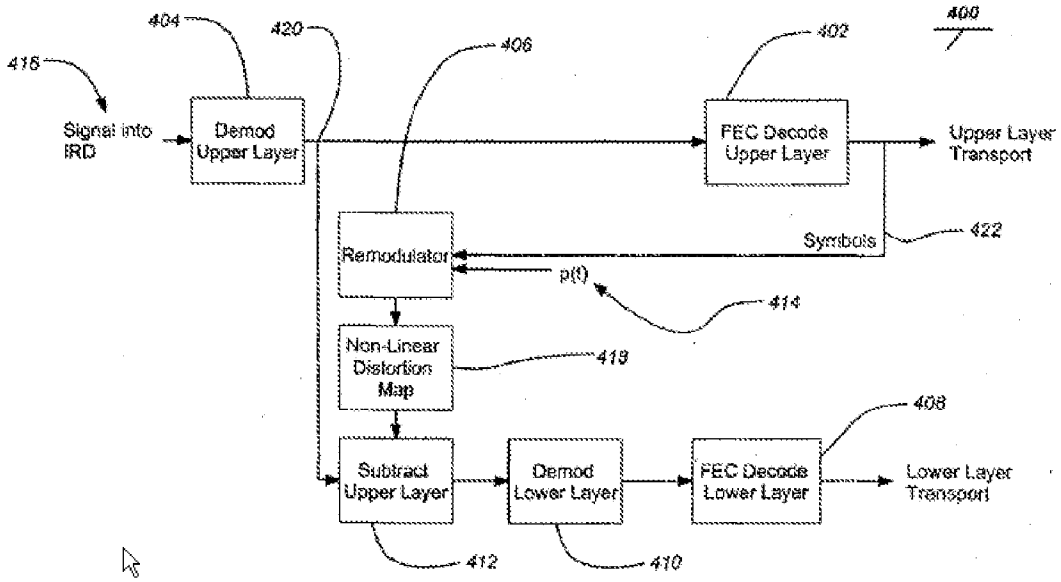


FIG. 4A

Nowhere does FIG. 4A of *Chen* even show a carrier signal. As such, it is not possible for FIG. 4A of *Chen* to describe, or even suggest, Applicant's claimed invention for recovering a carrier as a function of soft decisions. It should be noted that in FIG. 4A of *Chen*, signal 414 represents a pulse shaping filter *p(t)* – not a carrier (*Chen*, p. 9, ln. 13).

Likewise, nowhere does FIG. 4B of *Chen* describe, or suggest, Applicant's claimed invention. FIG. 4B of *Chen* is reproduced below.

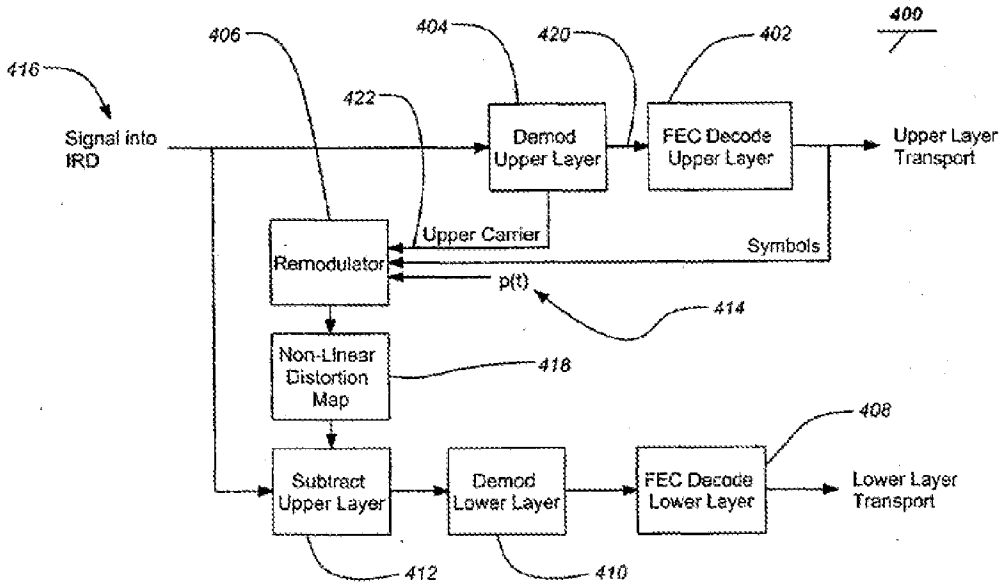
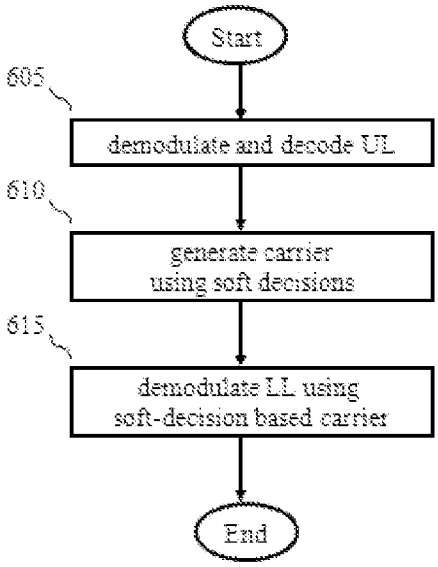


FIG. 4B

It can be observed from FIG. 4B of *Chen* that element 404 provides an upper carrier 422 **BEFORE** FEC Decode Upper Layer element 402. This upper carrier is not affected in any way by FEC Decode Upper Layer element 402 of *Chen*. As such, upper carrier 422 is not a recovered carrier based on **soft decisions** as claimed by Applicant. As described in *Chen*, upper carrier 422 and the symbols provided by FEC Decode Upper Layer element 402 are provided to remodulator 406, which "effectively produces an idealized upper layer signal which includes the upper layer carrier for subtraction from the received combined signal 416". (*Chen*, p. 8, lns. 22-24.)

In view of the above, there is simply no description, or suggestion, in *Chen* of recovering a carrier as a function of soft decisions as claimed by Applicant. Indeed, FIG. 11 of Applicant's specification simply illustrates the invention as claimed and is shown below.

FIG. 11



As illustrated above, in step 605 the upper layer (UL) is demodulated and decoded. From this, a carrier is generated using soft decisions in step 610. The lower layer (LL) is then demodulated using the soft-decision based carrier. Turning now to each of Applicant's independent claims, claim 1, in part, requires (emphasis added):

> receiving a multi-level modulation signal having at least two signal layers;

recovering a carrier from the received multi-level modulation signal as a function of soft decisions with respect to a first layer of the at least two layers; and

using the recovered carrier to recover a different layer of the at least two signal layers.

As described earlier, a simple comparison to FIGs. 4A and 4B of *Chen* clearly shows that nowhere does *Chen* recover a carrier as a function of soft decisions as required by Applicant's claim 1. As such, it is not possible for *Chen* to describe or suggest using the recovered carrier as required by Applicant's claim 1.

With regard to Applicant's independent claim 10, this claim requires in part (emphasis added):

generating a soft-decision based carrier from the received multi-level modulation signal as a function of the remapped first layer signal; and

demodulating a second layer signal component of the received multi-level modulation signal using the soft-decision based carrier.

Applicant's independent claim 10 clearly requires generating a carrier from the remapped first layer signal – the decoded signal, i.e., generating a soft-decision based carrier. Again, a simple comparison to FIGs. 4A and 4B of *Chen* clearly shows that nowhere does *Chen* recover a carrier as a function of soft decisions as required by Applicant's claim 10. As such, it is not possible for *Chen* to describe or suggest demodulating the second layer signal using the soft-decision based carrier as required by Applicant's claim 10.

With regard to Applicant's independent claim 16, this claim requires in part (emphasis added):

performing a carrier recovery process driven by soft decisions with respect to a first layer signal component of the received multi-level modulation signal to provide a recovered carrier; and

demodulating and decoding a second layer signal component of the received multi-level modulation signal as a function of the recovered carrier.

Applicant's independent claim 16 clearly requires performing a carrier recovery process driven by soft-decisions. Yet again, a simple comparison to FIGs. 4A and 4B of *Chen* clearly shows that nowhere does *Chen* show a carrier recovery process driven by soft

decisions as required by Applicant's claim 16. As such, it is not possible for *Chen* to describe or suggest demodulating and decoding the second layer signal as a function of the recovered carrier as required by Applicant's claim 16.

Finally, with regard to Applicant's independent claim 19, this claim requires in part (emphasis added):

> a carrier recovery element responsive to the remapped first layer signal and the received signal to provide a soft-decision based carrier;
>
> a derotator for derotating the received signal with the soft-decision based carrier to provide a derotated version of the received signal.

Applicant's independent claim 19 clearly requires performing a carrier recovery element responsive to the remapped first layer signal (dependent on the decoded first layer signal of claim 19) to provide a soft-decision based carrier. And, yet again, a simple comparison to FIGs. 4A and 4B of *Chen* clearly shows that nowhere does *Chen* show such a carrier recovery element as required by Applicant's claim 19. As such, it is not possible for *Chen* to describe or suggest a derotator as required by Applicant's claim 19.

Nor does *Jaffe* remedy this defect in *Chen*. All *Jaffe* describes is use of a Viterbi decoder for recovering data. Nowhere does *Jaffe* describe, or suggest, using soft decisions to generate a carrier as claimed by Applicant.

Finally, even if one combined *Chen* and *Jaffe* – there is no motivation to further modify this combination to yield Applicant's claimed invention. **Nowhere** do either *Chen* or *Jaffe* describe, or suggest, the problem identified and solved by Applicant. Absent an identification of the problem – there is simply no reason to further modify the combination of *Chen* and *Jaffe* to now recover a soft-decision based carrier as claimed by Applicant.

In view of the above, the combination of *Chen* and *Jaffe* does not yield Applicant's claimed invention. Whether *Chen* uses a Viterbi decoder to recover data is not Applicant's claimed invention. Applicant's claimed invention is directed to using soft decisions to generate a carrier, which is then used to recover a different layer of the signal. Applicant respectfully submits that independent claims 1, 10, 16 and 19 are patentable over *Chen* in view of *Jaffe*. As such, respective dependent claims 2-9, 11-15, 17-18 and 20-27, are also in condition for allowance.

VIII. CONCLUSION

For the above reasons, Applicant submits that claims 1-27 are patentable. It is therefore respectfully requested that the rejection of claims 1-27 under 35 U.S.C. § 103(a) be reversed.

Respectfully submitted,

Joshua Lawrence Koslov

By /Joseph J. Opalach/

Joseph J. Opalach
Registration No.: 36,229
(609) 734-6839

Patent Operations
Thomson Licensing LLC.
P.O. Box 5312
Princeton, New Jersey 08543-5312

July 23, 2010

IX. CLAIMS APPENDIX

1. (Original) A method for use in a receiver, the method comprising:

receiving a multi-level modulation signal having at least two signal layers;

recovering a carrier from the received multi-level modulation signal as a function of soft decisions with respect to a first layer of the at least two layers; and

using the recovered carrier to recover a different layer of the at least two signal layers.

2. (Original) The method of claim 1, wherein the multi-level modulation signal is a layered modulation signal.

3. (Original) The method of claim 2, wherein the recovering step further comprises:

demodulating the first layer of the received layered modulation signal to provide a demodulated first layer signal representing a stream of signal points;

soft decoding the demodulated first layer signal to provide a decoded first layer signal;

generating a remapped first layer signal from the decoded first layer signal, the remapped first layer signal representing a stream of symbols;

recovering a carrier from the received layered modulation signal using the remapped first layer signal;

and wherein the using step includes the step of

processing the received layered modulation signal with the recovered carrier to extract therefrom a second layer of the at least two layers of the received layered modulation signal.

4. (Original) The method of claim 3, wherein the generating step includes the steps of:

reencoding the decoded first layer signal to provide a reencoded first layer signal; and

remapping the reencoded first layer signal to provide the remapped first layer signal.

5. (Original) The method of claim 3, wherein the generating step remaps the decoded first layer signal to provide the remapped first layer signal.

6. (Original) The method of claim 3, wherein the processing step includes the step of filtering the received layered modulation signal for removing intersymbol interference associated with the first layer signal.

7. (Original) The method of claim 3, wherein the processing step includes the steps of:

derotating the received layered modulation signal with the recovered carrier to provide a derotated version of the received layered modulation signal;

filtering the remapped first layer signal; and

subtracting the filtered remapped first layer signal from the derotated version of the received layered modulation signal to extract therefrom the second layer.

8. (Original) The method of claim 3, wherein the processing step includes the steps of:

rerotating the remapped first layer signal using the recovered carrier to provide a rerotated remapped first layer signal;

filtering the rerotated remapped first layer signal; and

subtracting the filtered rerotated remapped first layer signal from the received layered modulation signal to extract therefrom the second layer.

9. (Original) The method of claim 1, wherein the first layer signal is an upper layer signal and the different layer is a lower layer signal.

10. (Original) A method for use in a receiver, the method comprising:

demodulating and soft decoding a first layer signal component of a received multi-level modulation signal to provide a decoded first layer signal;

remapping the decoded first layer signal to provided a remapped first layer signal;

generating a soft-decision based carrier from the received multi-level modulation signal as a function of the remapped first layer signal; and

demodulating a second layer signal component of the received multi-level modulation signal using the soft-decision based carrier.

11. (Original) The method of claim 10, wherein the received multi-level modulation signal is a received layered modulation signal.

12. (Original) The method of claim 10, wherein the first layer signal component is an upper layer component and the second layer signal component is a lower layer component.

13. (Original) The method of claim 10, wherein the demodulating step includes the step of derotating the received multi-level modulation signal using the soft-decision based carrier.

14. (Original) The method of claim 10, wherein the generating step includes the step of filtering the received multi-level modulation signal for removing intersymbol interference associated with the first layer signal component.

15. (Original) The method of claim 10, wherein the remapping step includes the step of first reencoding the decoded first layer signal.

16. (Original) A method for use in a receiver, the method comprising:

receiving a multi-level modulation signal;

performing a carrier recovery process driven by soft decisions with respect to a first layer signal component of the received multi-level modulation signal to provide a recovered carrier; and

demodulating and decoding a second layer signal component of the received multi-level modulation signal as a function of the recovered carrier.

17. (Original) The method of claim 16, wherein the first layer signal component is an upper layer signal component and the second layer signal component is a lower layer signal component.

18. (Original) The method of claim 16, wherein the multi-level modulation signal is a layered modulation signal.

19. (Original) Apparatus for use in a receiver, the apparatus comprising:

a first demodulator for demodulating a received signal to provide a demodulated first layer signal;

a first decoder for decoding the demodulated first layer signal to provide a decoded first layer signal;

a remapper for remapping the decoded first layer signal to provide a remapped first layer signal; and

a carrier recovery element responsive to the remapped first layer signal and the received signal to provide a soft-decision based carrier;

a derotator for derotating the received signal with the soft-decision based carrier to provide a derotated version of the received signal; and

an extractor responsive to the derotated received signal and remapped first layer signal for providing a second layer signal component of the received signal.

20. (Original) The apparatus of claim 19, wherein the extractor comprises a filter for filtering the remapped first layer signal and a subtraction element for subtracting the filtered remapped first layer signal from the derotated version of the received signal.

21. (Original) The apparatus of claim 19, further comprising a second demodulator for demodulating the second layer signal component of the received signal to provide a demodulated second layer signal.

22. (Original)The apparatus of claim 21, further comprising a second decoder for decoding the demodulated second layer signal to provide a decoded second layer signal.

23. (Original) The apparatus of claim 19, wherein the apparatus is an integrated circuit.

24. (Original) The apparatus of claim 19, wherein the carrier recovery element includes a phase error estimator responsive to the received signal and the remapped first layer signal for estimating phase errors therebetween.

25. (Original) The apparatus of claim 19, wherein the remapper includes an encoder for reencoding the decoded first layer signal.

26. (Original) The apparatus of claim 19, wherein the received signal is a layered modulation signal.

27. (Original) The apparatus of claim 19, wherein the carrier recovery element further includes a filter for removing intersymbol interference associated with the first layer signal component from the received signal.

X. EVIDENCE APPENDIX (**NONE**)

None.

XI. RELATED PROCEEDINGS APPENDIX (**NONE**)

None.